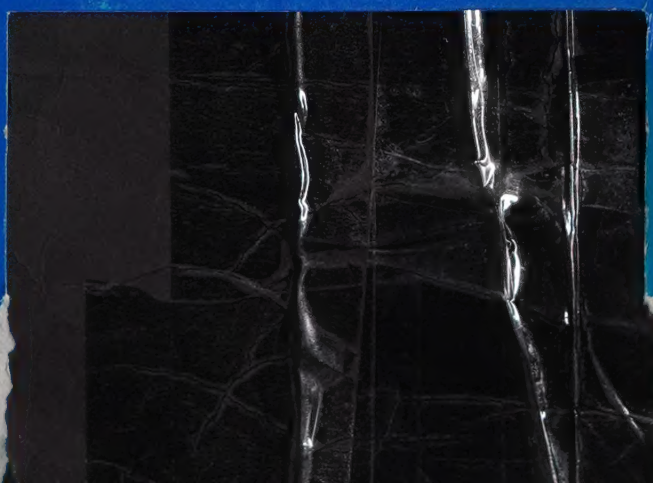
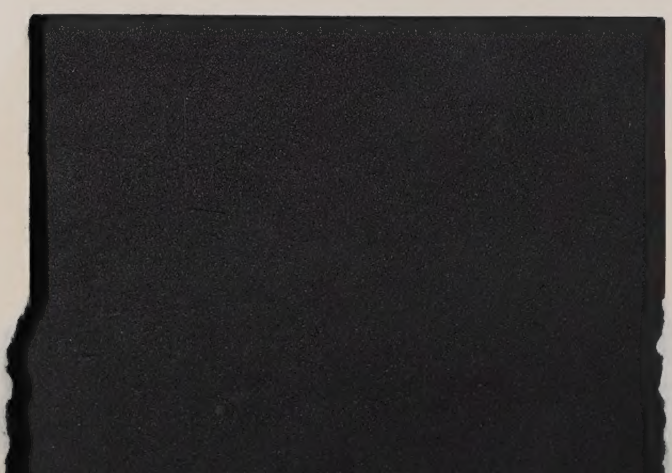
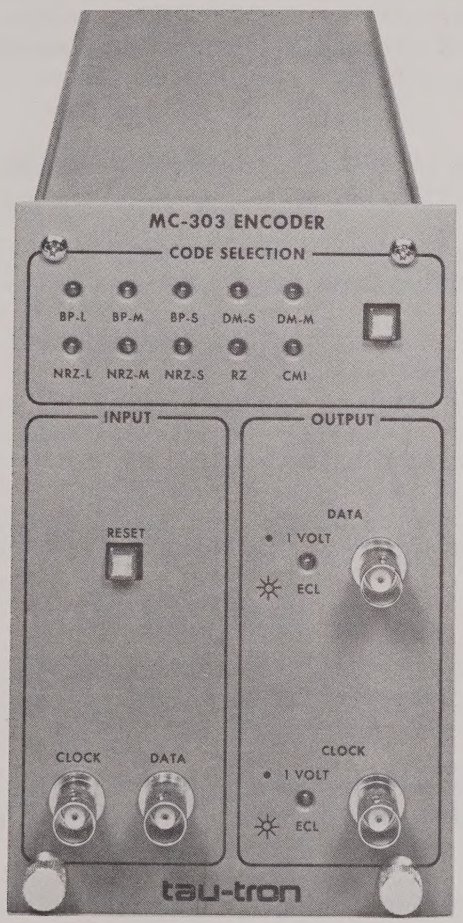


MC-303
PART NO. 8200-0057



tau-tron
A UNIT OF
GENERAL SIGNAL



MC-303

BINARY ENCODER

OPERATION MANUAL
FORM 0227-0283B

© 1984 by Tau-tron Inc., 10 Lyberty Way, Westford, MA 01886
(617) 692-5100 Telex 750245 1-800-TAU-TRON (Outside MA)

WARRANTY

All Tau-tron products are warranted against any defects in material and workmanship. This warranty applies for one year form the date of delivery for all Tau-tron manufactured products. The warranty period for OEM products sold by Tau-tron will depend on the original OEM warranty (consult factory for specific products). We will repair or replace products which, upon our examination, prove to be defective during the warranty period.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING FITNESS FOR PURPOSE, MERCHANTABILITY OR OTHERWISE, IS GIVEN.

For any assistance, contact Customer Service with details of the instrument model, serial numbers and malfunction, see Repair Returns below.

SHIPPING DAMAGE

If any signs of damage are noted on the outside of the carton, request the carrier's agent to be present during unpacking. If external damage is found on the instrument, follow Repair Returns procedure below.

Check the electrical performance of the instrument as soon as possible after receipt. If any malfunctions are observed, follow Repair Returns procedure below.

REPAIR RETURNS

For mechanical damage or electrical malfunctions, notify Tau-tron immediately and it the damage occurred during shipping, also notify the carrier. To return a unit for repair:

1. Call the Customer Service Department, (617) 692-5100, for a Repair Authorization Number. This will reduce administrative delays and ensure prompt return of your unit.

2. Complete and attach the Repair Tag, in the rear of the manual, to your unit for positive identification.

3. Pack the unit in the original shipping carton and packing materials, if available. Otherwise use a double-walled carton (test strength of 350 lb) and shock absorbing material such as bubblewrap to prevent the unit from moving the carton during transit. Secure the carton by sealing with heavy paper tape.

4. Send to: Tau-tron, Inc.
   10 Lyberty Way
   Westford, MA 01886
   Attn: Customer Service

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https://archive.org/details/manualsplus_10518

1. SCOPE

This instruction manual has been prepared primarily for the purpose of assisting operations personnel in providing effective operation and routine maintenance of the MC-303 Binary Encoder.

This manual includes procedures for removal and installation, operation, theory, and routine maintenance.

All information, illustrations, and specifications contained in this manual are based on the latest product information available at time of publication. If your model differs from the specifications contained in this manual, consult the factory for information.

The right is reserved to make changes in specifications and methods at any time without notice.

2. DESCRIPTION

The MC-303 Binary Encoder generates ten binary code formats, one at a time, selectable via a front-panel pushbutton control. The binary code formats available are; NRZ (level, mark, or space), BiPhase (level, mark, or space), Delay Modulation (mark or space), Return-to-Zero, and Coded Mark Inversion. The frequency range of the Encoder is 1 kHz to 285 MHz in NRZ and 1 kHz to 145 MHz in BiPhase, CMI, and Delay Modulation.

The module is designed for use with the MN-302 BERT Transmitter although, because of its standard ECL input signal specification, the Encoder may be used with any signal source operating within the specified frequency range.

The output level is selectable; with either 1V into 50 ohms-to-ground or 1V into 50 ohms to -2V, this applies to both the clock and data outputs.

The quarter-size module is designed for use in Tau-tron Modular Instrumentation (TMI) and requires a mainframe for power and cooling.

3. SPECIFICATIONS

This section describes the specfications for the MC-303 Binary Encoder.

3.1 INPUTS

3.1.1 CLOCK
ECL signal levels, input termination is 50 ohms to -2V.

3.1.2 DATA
NRZ format, ECL signal levels, input termination is 50 ohms to -2V.

3.1.3 FREQUENCY RANGE
1 kHz to 325 MHz.

3.2 OUTPUTS

3.2.1 CLOCK
1V ±200 mV into 50 ohms-to-ground or 1V into 50 ohms to -2V, selected by internal slide switch.

3.2.2 DATA
1V ±200 mV into 50 ohms-to-ground or 50 ohms to -2V, selected by internal slide switch. The format is RZ, NRZ-L, NRZ-M, NRZ-S, BiPhase-L, BiPhase-M, BiPhase-S, DM-M, DM-S, or CMI.

3.2.3 RISE/FALL TIME-CLOCK AND DATA
1.0 ns. max., 500 ps typical (10%-90%) ± 7% max. distortion when driving a 50 ohm DC load.

3.2.4 CLOCK/DATA SKEW
The relationship between the rising edge of the clock and the data is 0 ±500 ps.

3.3 MECHANICAL
TMI quarter-size module. DIMENSIONS: 6.375 in. high x 4 in. wide x 11 in. deep. WEIGHT: 3 lb net, 5 lb shipping.

3.4 POWER
120, 220, or 240V ±10%, 48 to 66 Hz, 240 VA supplied by MF-5 Mainframe.

3.5 ACCESSORIES SUPPLIED
Instruction Manual

3.6 OPTIONS
OP-02 IEEE-488 Interface (GPIB)
For remote control of code selection. Requires MF-5 with OP-02 (GPIB) installed.

4. INSTALLATION

This section provides recommendations for installing the MC-303. It covers MF-5 Mainframe site requirements and module insertion/removal of the MC-303 in the MF-5 Mainframe as shown in Figure 4-1.

4.1 SITE REQUIREMENTS

A typical MF-5 Mainframe with MC-303 should be set up in an environment free from extremes in humidity, temperature and vibration (refer to the table below). As a rule, adequate lighting in addition to front and rear access to the unit should be provided. Similarly, the user should avoid placing the unit in areas where high concentrations of heat from associated equipment are produced. In additon, the unit should not be set up in areas where cable congestion could become quite prevalent.

AC Power	120, 220, or 240V ± 10%, 48 to 66 Hz
Temperature	32°F to 95°F (0°C to 35°C) operating.
Humidity	0% to 95% RH max. at 20°C, non-condensing.
Size	10 in. high x 17.75 in. wide x 18.5 in. deep.
Weight	38 lb net.
Clearances	2 in. min. rear, 1/2 in. min. top, to allow cooling air to be drawn in the rear and exhausted through the top.

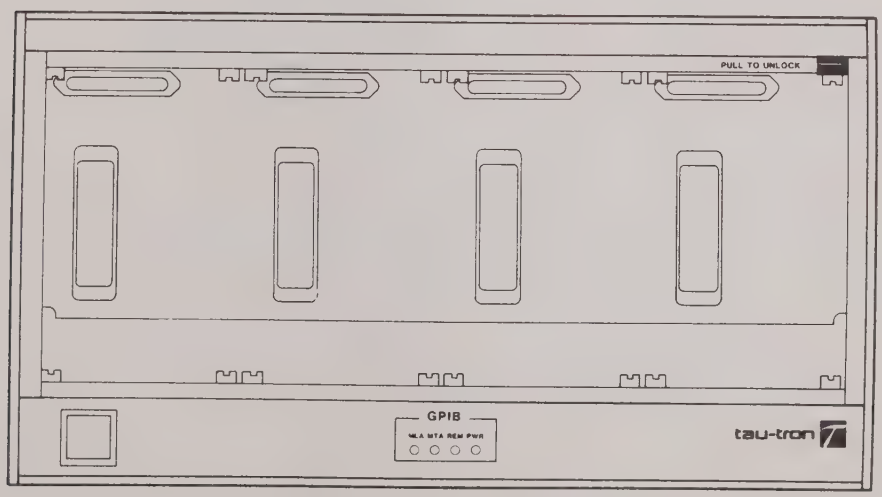


FIGURE 4-1. MF-5 MAINFRAME.

4.2 MODULE INSERTION

1. Pull out the mainframe Module Lock knob.
2. Insert the module as required.
3. Push in the Module Lock knob.

The MC-303 may be inserted in any position in the mainframe.

4.3 MODULE REMOVAL

1. Pull out the mainframe Module Lock knob.
2. Grasp the module to be removed by its front-panel BNC connectors and pull to remove.
3. Push in the Module Lock knob to prevent the remaining modules from accidentally falling out.

5. FRONT PANEL

This section describes the front-panel controls and connectors as shown in Figure 5.1.

1. DATA OUTPUT — BNC connector, drives a DC coupled 50-ohm load, the termination voltage may be ground (1V) or -2V (ECL).

2. DATA OUTPUT/ 1V, ECL — Set by internal printed circuit board slide switch. The LED indicator is lit when the ECL output is selected.

3. CLOCK OUTPUT — BNC connector, drives a DC coupled 50-ohm load, the termination voltage may be ground (1V) or -2V (ECL).

4. CLOCK OUTPUT/ 1V, ECL — Set by internal printed circuit board slide switch. The LED indicator is lit when the ECL output is selected.

5. DATA INPUT — BNC connector, input termination is 50 ohms to -2V. ECL signal levels, NRZ data format.

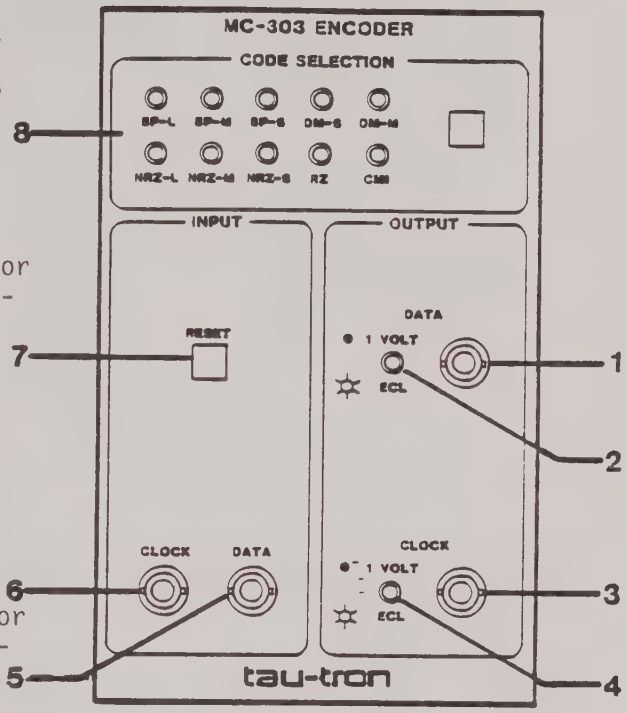


FIGURE 5-1. FRONT PANEL.

6. CLOCK INPUT — BNC connector, input termination is 50 ohms to -2V. ECL signal levels.

7. RESET — Pushbutton, synchronously restarts the Encoder whenever a code selection is made or signal inputs are interrupted.

8. CODE SELECTION — Pushbutton with corresponding LED indicators, selects desired output coding scheme.

6. OPERATION

6.1 SYSTEM CONNECTIONS

A typical system interconnection diagram is shown on the following page. When the MC-303 is driven from an MN-302, a pair of 50-ohm cables of equal length should be used at the MC-303 CLOCK and DATA Inputs.

NOTE: The MN-302 CLOCK and DATA Outputs must be set to ECL.

6.1.1 INPUT TIMING SPECIFICATION

If the MC-303 is driven from a source other than an MN-302, or if there is some doubt as to the relationship between the MN-302 Outputs, the input timing to the MC-303 should be set as follows:

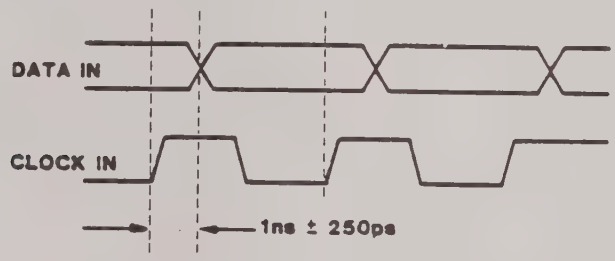


FIGURE 6-1. INPUT TIMING.

6.1.2 DATA AND CLOCK OUTPUT SELECT

A slide switch mounted internally on the printed circuit board selects the 1V or the ECL output level. The module must be removed from the mainframe in order to make the selection.

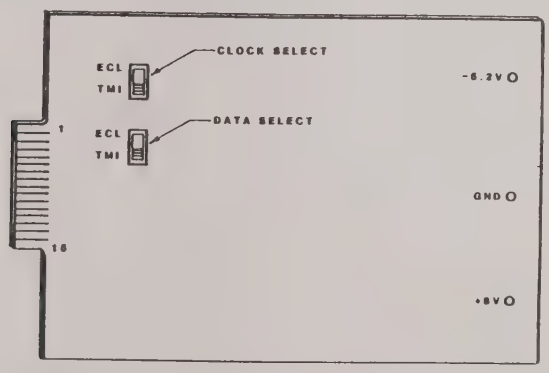


FIGURE 6-2. SLIDE SWITCH LOCATION DIAGRAM.

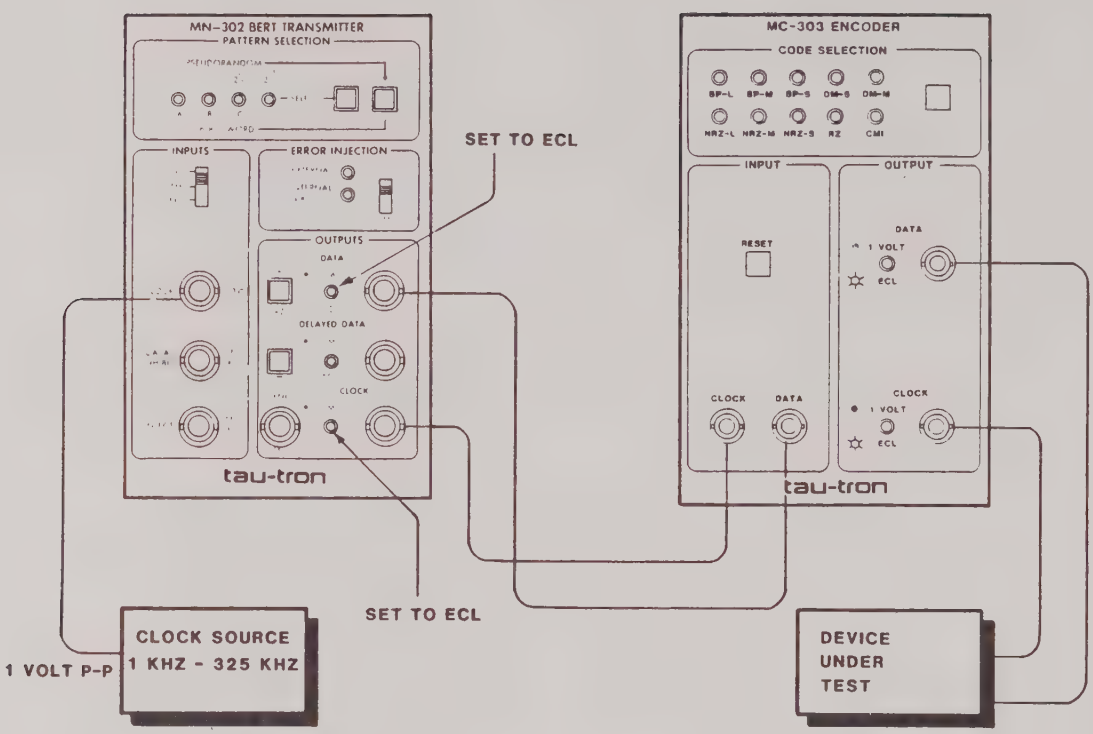


FIGURE 6-3. MC-303 SYSTEM CONNECTION DIAGRAM.

7. THEORY OF OPERATION

The following paragraphs contain the Theory of Operation for the MC-303 Binary Encoder module, including the MC-303 circuit functions and its associated power supplies. Refer to Section 10, Diagrams, for diagrammatical descriptions of the MC-303.

7.1 DESCRIPTION

The MC-303 accepts clock and NRZ data and converts the data to 1 of 10 front-panel selectable output formats. The module operates from 1 kHz to 285 MHz.

7.2 CIRCUIT FUNCTIONS

The clock and data input signals are first conditioned by two MA-550M high-speed hybrid amplifiers. The conditioned data are then latched by the clock to ensure constant timing relationships at the various Encoder circuits. The clock then drives a synchronous start-up circuit which is used to ensure simultaneous glitch-free clocking of all Encoder circuits on start-up. The NRZ data and clock are then fanned out to the different Encoder sections which generate RZ, NRZ, BiPhase, Delay Modulation, and CMI Codes. The encoded data are next input to a selector which, via front-panel or GPIB control, selects 1 of 10 codes to be output to the front panel. The selected output data stream is then latched by a high-speed latch which is clocked by a double rate clock generated on the encoder board. At this point, the encoded data and input rate clock are conditioned via MA-550M amplifiers and fed to the front-panel output connectors.

7.3 MODULE POWER SUPPLIES

The MC-303 develops its internal voltage from the +17V and -17V mainframe unregulated voltages. A pair of three-terminal regulators on the module rear panel generate +8V and -5.2V, respectively. On-card regulators develop +5V from the +8V input and -2.0V from the -5.2V regulator.

8. GPIB OPTION

General All front-panel controls can be remotely controlled by a GPIB-compatible controller. The controller connects to the rear panel of the MF-5 Mainframe. An associated address/control switch, also on the rear panel of the MF-5, must be properly set for the type of operation desired.

Message Format The message consists of three digits (in ASCII code) followed by a terminator.

Ident	SELECT 1	SELECT 2	Terminator

Ident	Digit	Meaning
	5	MC-303

SELECT 1	Digit	Meaning
	0	BiPhase-L
	1	BiPhase-M
	2	BiPhase-S
	3	DM-S
	0	DM-M
	1	NRZ-L
	2	NRZ-M
	3	NRZ-S
	0	RZ
	1	CMI

SELECT 2	Digit	Meaning
	0	BiPhase-L
	0	BiPhase-M
	0	BiPhase-S
	0	DM-S
	1	DM-M
	1	NRZ-L
	1	NRZ-M
	1	NRZ-S
	2	RZ
	2	CMI

Terminator Terminators recognized are comma, CR and LF. Alternatively, an EOI signal may be used as the message terminator.

9. SERVICE

DANGER

Hazardous voltages exist in this equipment. Do not attempt access to the interior without disconnecting the line cord from the power receptacle to the MF-5 Mainframe.

9.1 ROUTINE SERVICE

Routine service includes the performance of checks and service procedures which prevent or minimize the downtime of the unit. The checks and service are simplified, and may be limited to visual inspection for defective components, loose hardware and/or accumulation of dust within the unit at critical areas.

NOTE: It is recommended that periodic cleaning (approximately once every three months) of the interior and exterior of the unit be done with a vacuum cleaner.

Refer to Section 4, Installation, for module removal.

9.2 REPAIR RETURNS

For mechanical damage or electrical malfunctions, refer to Page ii, Repair Returns.

9.3 ASSISTANCE

For service assistance call the Tau-tron Customer Service Dept., ~~(617)256-9013~~ (617) 692-5100. Their experience and expertise can often save you valuable time in correcting any equipment malfunction.

9.4 TOUBLE ANALYSIS

DANGER

Hazardous voltages exist in this equipment. Do not attempt access to the interior without first disconnecting the line cord from the power receptacle to the MF-5 Mainframe.

INPUT/OUTPUT LEVELS

Verify that proper input/output levels are correct. (Refer to Sections 3 and 6, Specifications and Operation, respectively.)

CALIBRATION

Routine calibration is not normally required except in the following situations:

a. Failed component or circuit. Consult factory for further details.

b. Harsh environment; typical environment is:

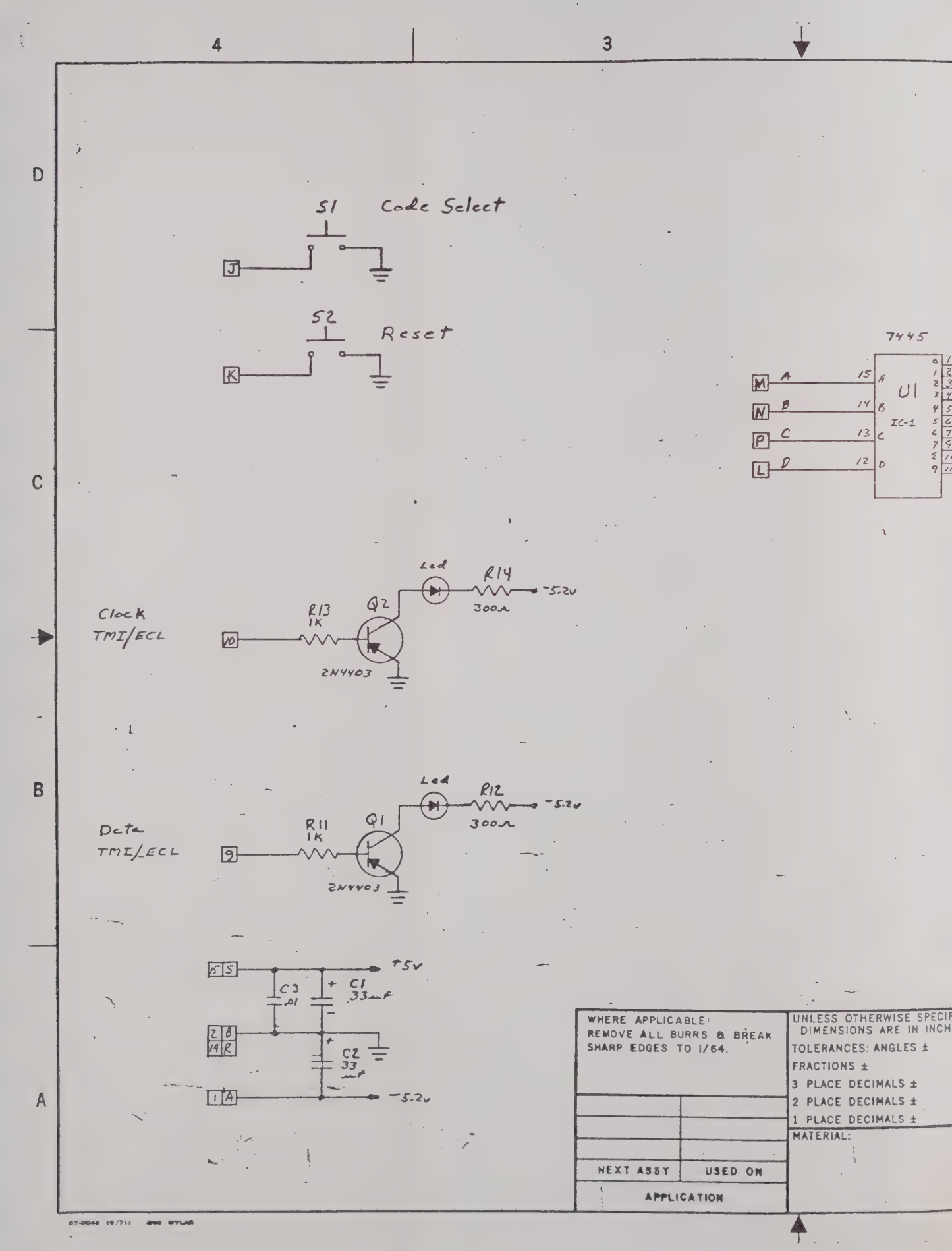
Temperature	32°F to 95°F (0°C to 35°C)
Humidity	0% to 95% RH max. at 20°C, non-condensing.

Any calibrations or technical adjustments other than the situations mentioned above should not be made during the Warranty period unless otherwise authorized. Consult factory for further details. (Refer to sections 3 and 6, Specifications and Operation, respectively, for proper inputs and outputs.)

10. DIAGRAMS

This section includes the following figures:

FIGURE	DESCRIPTION	PAGE
10-1	Front-Panel Schematic	10-2
10-2	MC-303 Encoder Schematic	10-3
10-3	Power Supply Schematic	10-4
10-4	Wiring Diagram	10-5
10-5	GPIB Interface Schematic (OP-02 Only)	10-6


4
3
D
C
B
A
S1 Code Select
J
S2 Reset
K
7445
U1
IC-1
M
N
P
L
A
B
C
D
15
14
13
12
Clock TMI/ECL
V0
R13 1K
Q2
2N4403
Led
R14 300Ω
-5.2v
Data TMI/ECL
9
R11 1K
Q1
2N4403
Led
R12 300Ω
-5.2v
+5v
C3 .01
C1 33mf
C2 33 mf
-5.2v
WHERE APPLICABLE: REMOVE ALL BURRS & BREAK SHARP EDGES TO 1/64.
UNLESS OTHERWISE SPECIF
DIMENSIONS ARE IN INCH
TOLERANCES: ANGLES ±
FRACTIONS ±
3 PLACE DECIMALS ±
2 PLACE DECIMALS ±
1 PLACE DECIMALS ±
MATERIAL:
NEXT ASSY
USED ON
APPLICATION

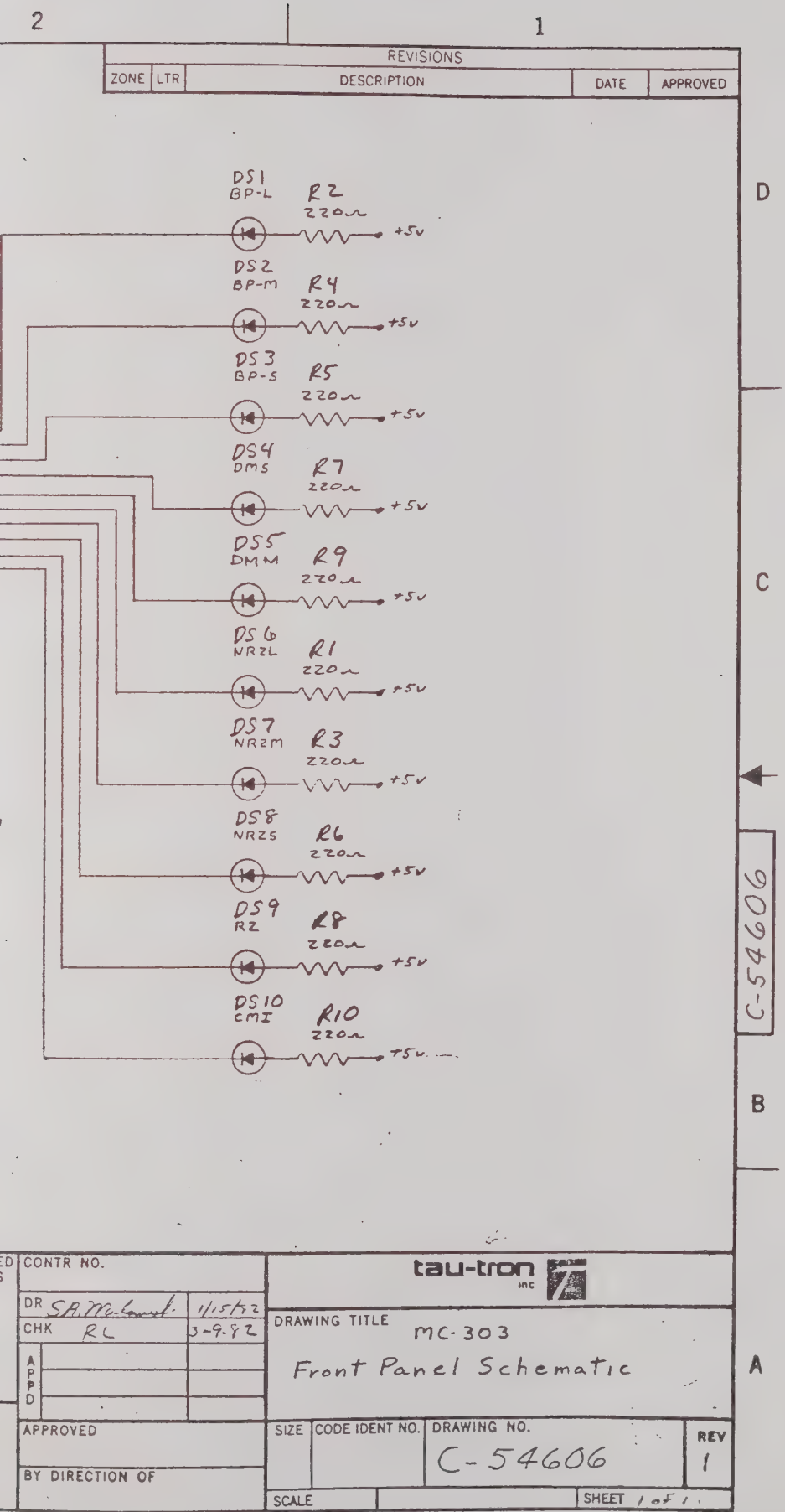
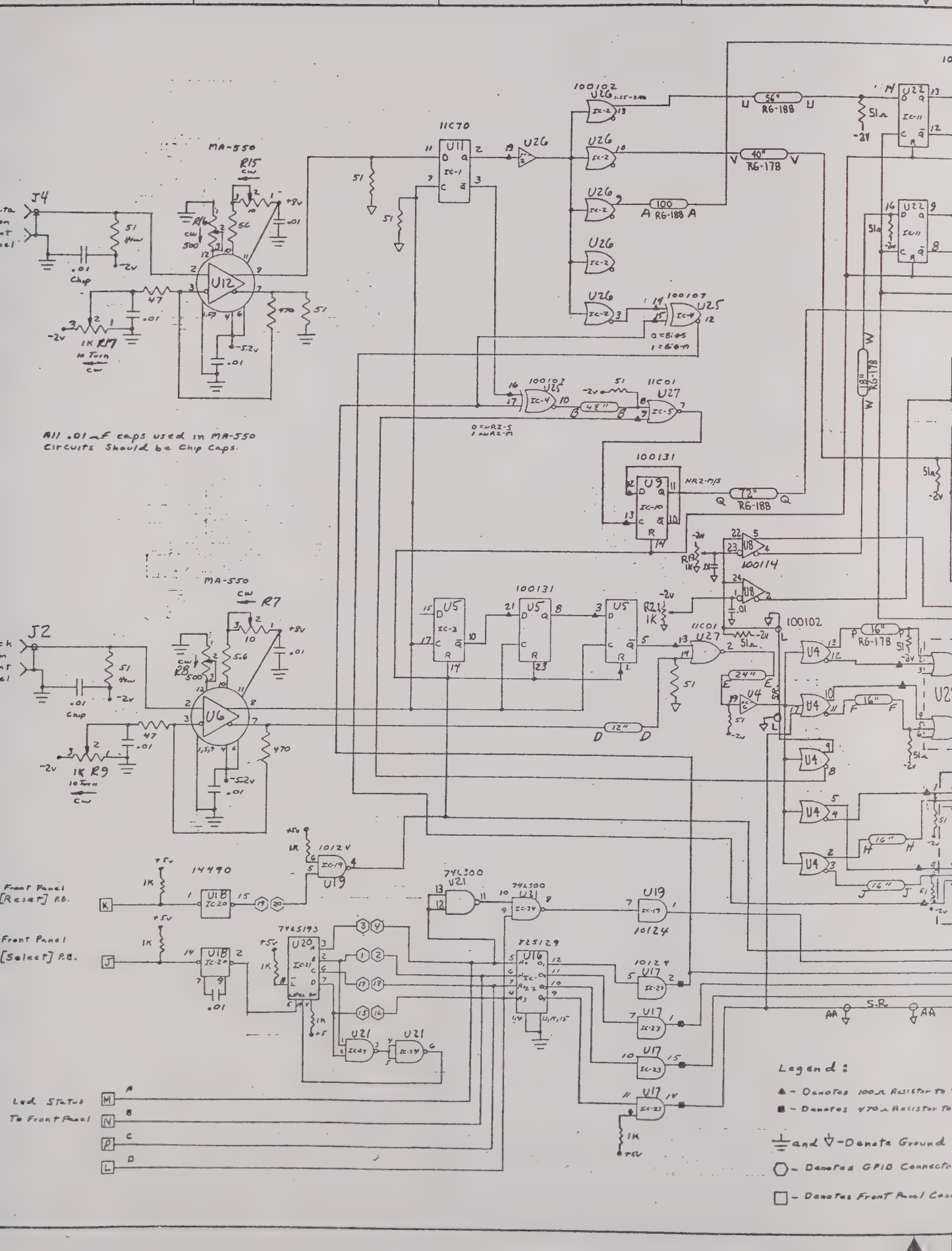
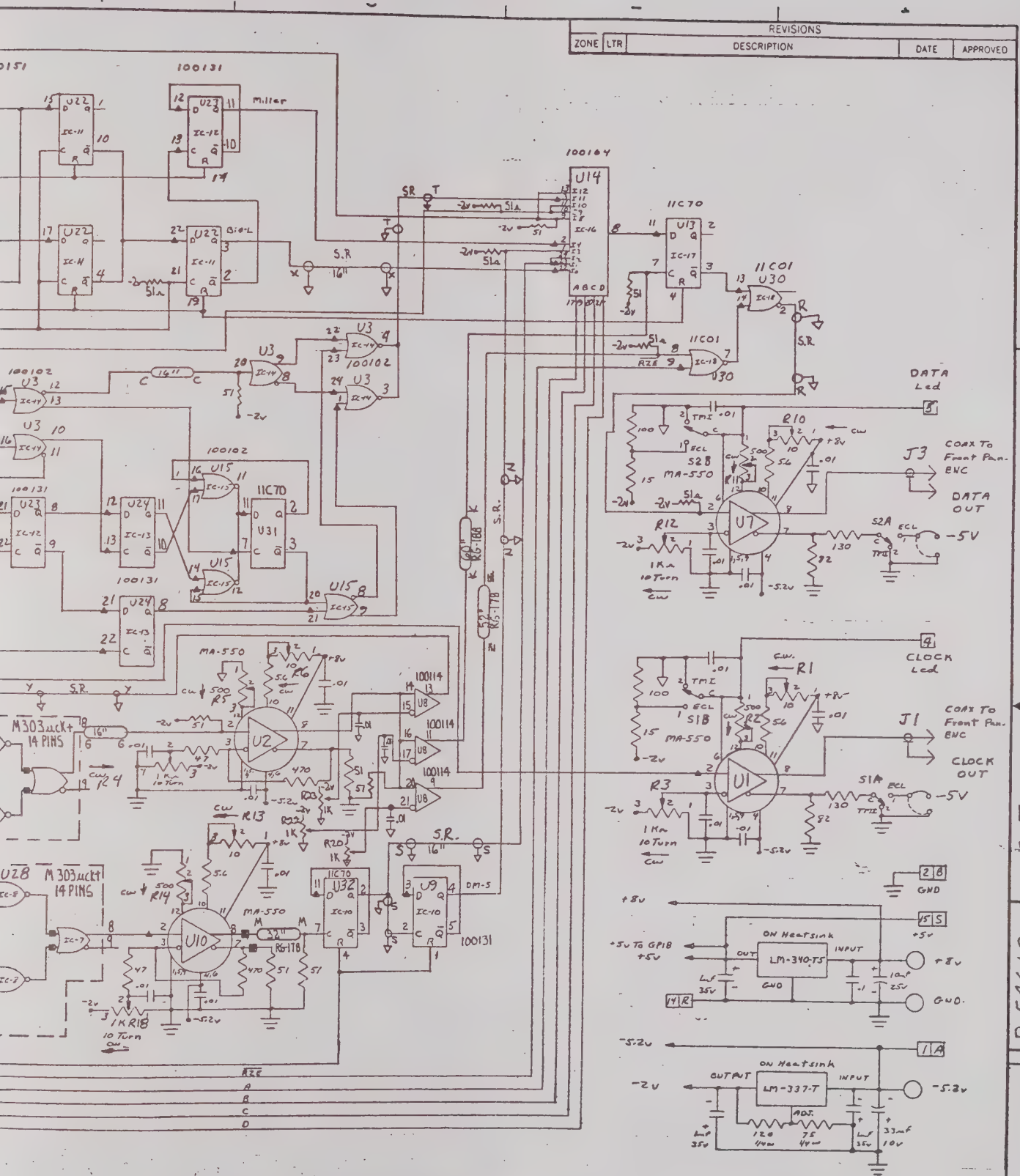
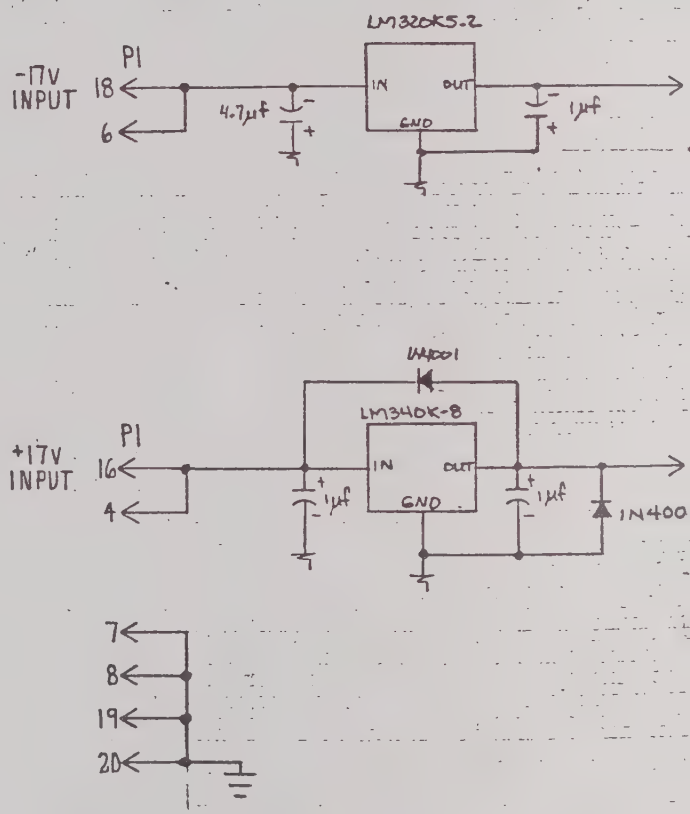

2
1
REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVED
DS1 BP-L
R2 220Ω
+5V
DS2 BP-M
R4 220Ω
+5V
DS3 BP-S
R5 220Ω
+5V
DS4 DMS
R7 220Ω
+5V
DS5 DMM
R9 220Ω
+5V
DS6 NRZL
R1 220Ω
+5V
DS7 NRZM
R3 220Ω
+5V
DS8 NRZS
R6 220Ω
+5V
DS9 RZ
R8 220Ω
+5V
DS10 CMI
R10 220Ω
+5V
D
C
B
A
C-54606
CONTR NO.
DR S.A. McLeod 11/15/82
CHK R.L 3-9-82
APPD
APPROVED
BY DIRECTION OF
tau-tron inc
DRAWING TITLE
MC-303
Front Panel Schematic
SIZE
CODE IDENT NO.
DRAWING NO.
C-54606
REV
1
SCALE
SHEET 1 of 1

Fig. 10-1
1 of 1


MA-550
R15
J4
R14
U12
51
.01
Chip
47
1K R17
10 Turn
CW
470
-5.2V
All .01 mF caps used in MA-550 Circuits Should be Chip Caps.
MA-550
R7
J2
R8
U6
1K R9
10 Turn
11C70
U11
U26
100102
100107
U25
11C01
U27
100131
U9
NRZ-M/S
100114
U8
U5
R21
1K
R9
1K
U4
RG-188
RG-178
51Ω
-2V
+5V
14490
U18
IC-20
U19
10124
74LS00
U21
74LS193
U20
82S129
U16
U17
Front Panel [Reset] P.B.
Front Panel [Select] P.B.
Led STATUS To Front Panel
Legend :
▲ - Denotes 100Ω Resistor To
■ - Denotes 470Ω Resistor To
⏚ and ▽ - Denote Ground
⬡ - Denotes GPIB Connecto
□ - Denotes Front Panel Con


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
100131
Miller
100164
U14
11C70
U13
11C01
U30
S.R.
DATA Led
J3
COAX To Front Pan. BNC
DATA OUT
R10
S2B
MA-550
S2A
-5V
R12
1Ka 10Turn
CLOCK Led
J1
CLOCK OUT
R1
S1B
S1A
R3
U7
U1
U2
U10
M303 ckt 14 PINS
R13
R14
R18
U28
U31
U32
U9
100102
100114
GND
+5V
+8V
-5.2V
-2V
ON Heatsink
LM-340-T5
LM-337-T
INPUT
OUTPUT
+5V To GPIB
D-54610
WHERE APPLICABLE: REMOVE ALL BURRS & BREAK SHARP EDGES TO 1/64.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES ±
FRACTIONS ±
3 PLACE DECIMALS ±
2 PLACE DECIMALS ±
1 PLACE DECIMALS ±
MATERIAL:
54612 . MC303
NEXT ASSY | USED ON
APPLICATION
CONTR NO.
DR SAM 11/15/82
CHK RL 6-24-82
APPD
APPROVED
BY DIRECTION OF
tau-tron inc
Fig. 10-2
1 of 1
DRAWING TITLE
MC-303
HIGH SPEED BINARY ENCODER
SIZE D | CODE IDENT NO. | DRAWING NO. D-54610 | REV 1
SCALE MC303 | SHEET 1 OF 1



A) RESISTACE VALUES ARE IN OHMS 1/4W ± 5%.
B) CAPACITACE VALUES ARE IN MICROFARADS.
1. UNLESS OTHERWISE SPECIFIED:

NOTES:

WHERE APPLICABLE: REMOVE ALL BURRS & BREAK SHARP EDGES TO 1/64.	UNLESS OTHE DIMENSIONS TOLERANCES: A FRACTIONS ± 3 PLACE DECI 2 PLACE DECI 1 PLACE DECI
	MATERIAL:
D-54636	MC-550
NEXT ASSY	USED ON
APPLICATION	

2 | 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASE TO PRODUCTION 2 June 82 JRS	6/3/82	

D

-5.2V TO NRZ/RZ ECODER CARD.

C

8V TO NRZ/RZ ECODER CARD.

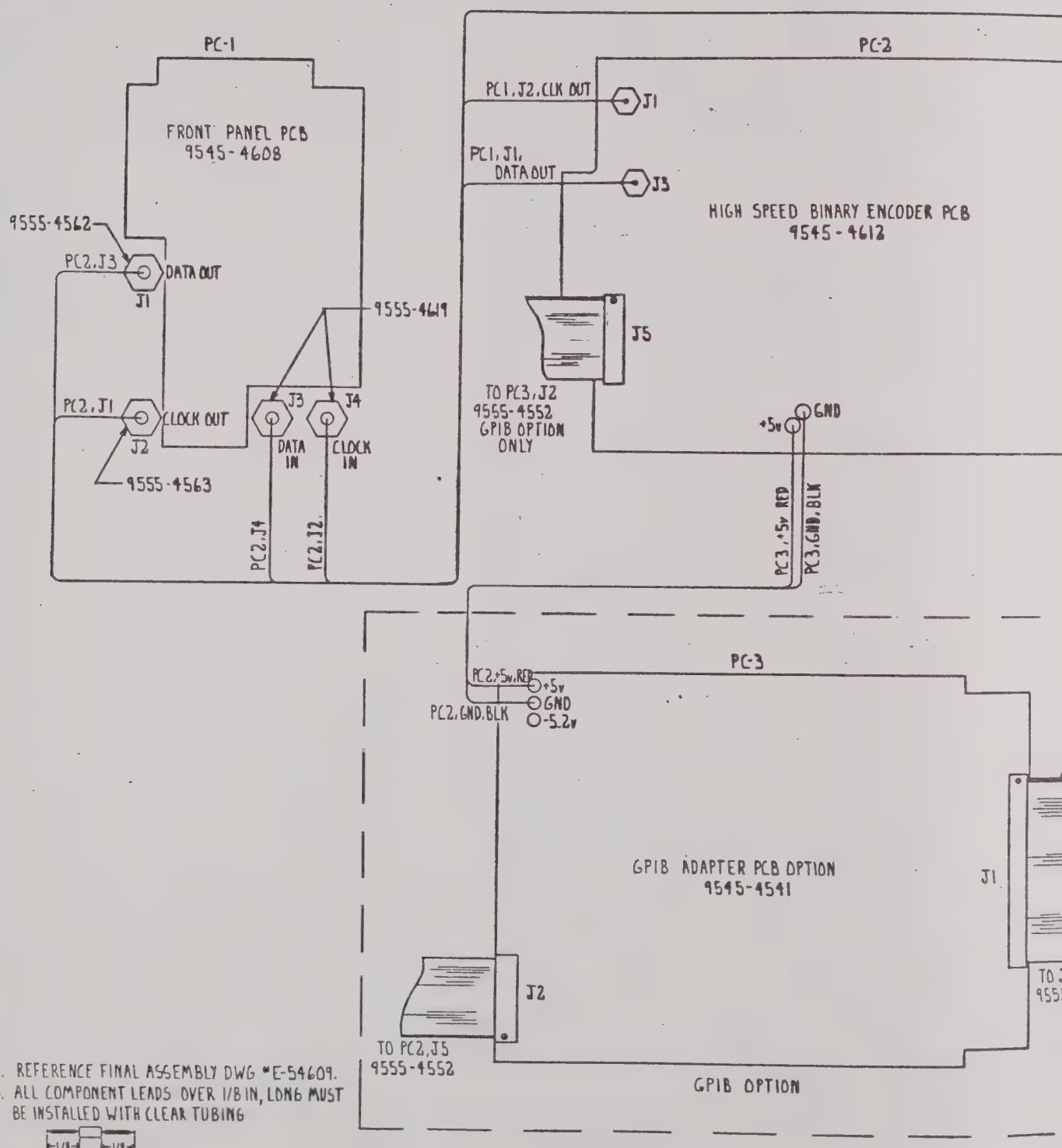
C-54627

B

A

VISE SPECIFIED RE IN INCHES	CONTR NO.	tau-tron inc	
GLES ±	DR PR Gunderson	3/4/82	
	CHK B. Cooper	3/5/82	DRAWING TITLE: MODULE POWER SUPPLY
ALS ±	APPD PR Gunderson	3-5-82	
ALS ±			
ALS ±	B Cox	6-4-82	
	APPROVED	SIZE: C / CODE IDENT NO. / DRAWING NO.: C-54627 / REV: A	
	BY DIRECTION OF	SCALE ~ / MC550 / SHEET 1 OF 1	

Fig. 10-3
1 of 1

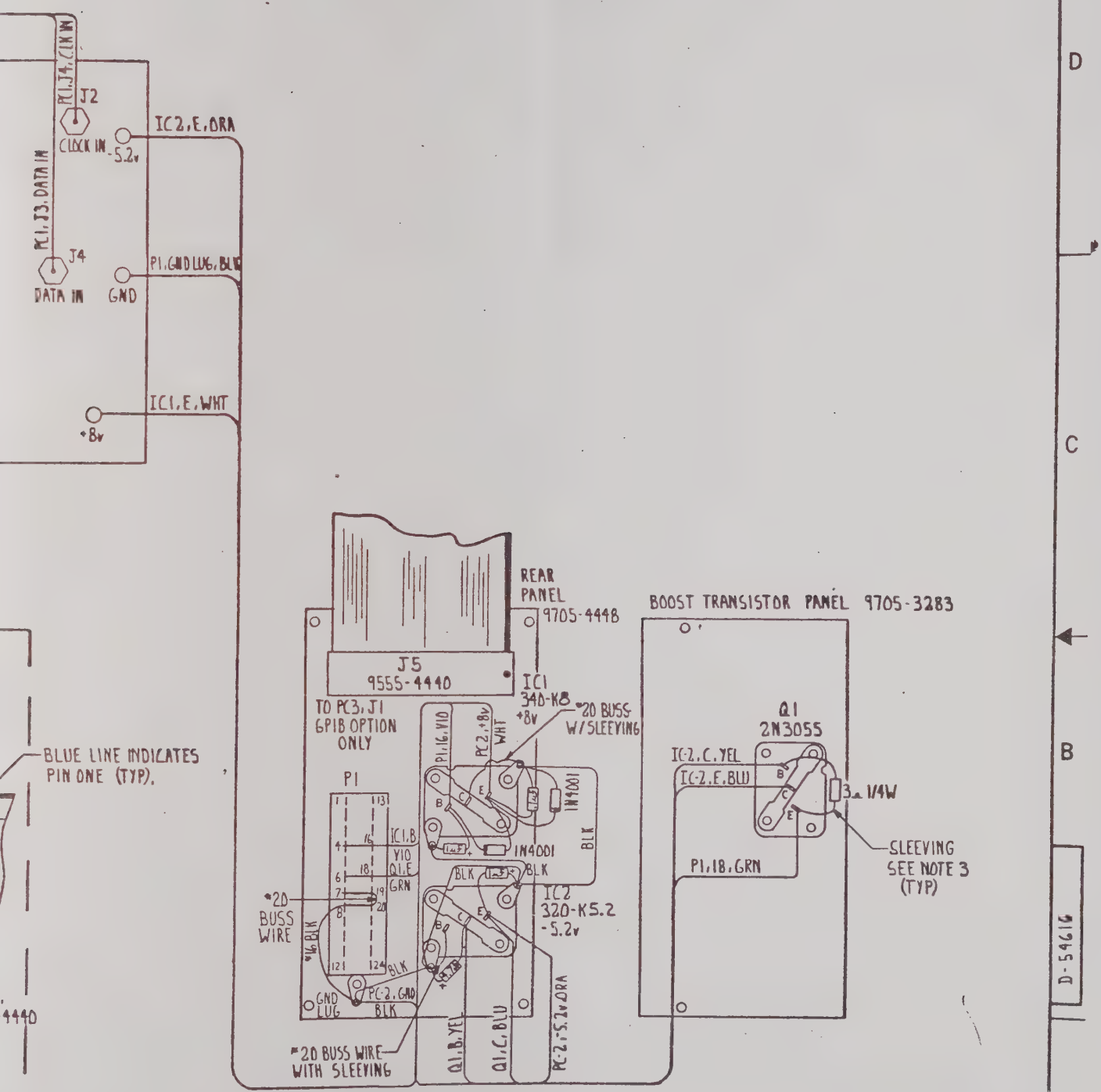


4. REFERENCE FINAL ASSEMBLY DWG #E-54609.
3. ALL COMPONENT LEADS OVER 1/8 IN, LONG MUST BE INSTALLED WITH CLEAR TUBING

2. ALL WIRE TO BE #20 AWG.
A) RESISTACE VALUES ARE IN OHMS 1/4W ±5%.
B) CAPACITACE VALUES ARE IN MICROFARADS.
1. UNLESS OTHERWISE SPECIFIED:

NOTES:

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



WHERE APPLICABLE: REMOVE ALL BURRS & BREAK SHARP EDGES TO 1/64.	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	CONTR NO.		tau-tron inc	Fig. 10-4 1 of 1
	TOLERANCES: ANGLES ±	DR Brent M Burdin	3/20/82		
	FRACTIONS ±	CHK B. Cooper	3-25-82	DRAWING TITLE MC-303 WIRING DIAGRAM	
	3 PLACE DECIMALS ±	APPD SAM Ltd.	3/25/82		
	2 PLACE DECIMALS ±				
	1 PLACE DECIMALS ±				
E-54609 / MC-303	MATERIAL:	APPROVED		SIZE D / CODE IDENT NO. / DRAWING NO. D-54616 / REV D	
NEXT ASSY / USED ON		BY DIRECTION OF		SCALE 1/1 / MC-303 / SHEET 01	
APPLICATION					

FOR FUTURE UPDATES

If you want to receive updates or revised issues of this manual, please complete and mail the postage paid card below. *If you fail to do so, important updated information pertaining to this document will not be forwarded to you.*

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Repair Returns

To return a unit for repair:

1. Call the Customer Service Dept. **(617) 692-5100** or **1-800-TAU-TRON (outside MA),** for a **Repair Authorization Number.** This will reduce administrative delays and ensure prompt return of your unit.
2. Complete and **attach one of the Repair Tags** below to your unit.
3. **Pack the unit** in the original shipping carton and packaging materials, if available. Otherwise use a double-walled carton (test strength of 350 lb) and shock absorbing material such as bubble wrap to prevent the unit from moving in the carton during transit. Seal with heavy paper tape.
4. **Send to:**

   Tau-tron
   10 Lyberty Way
   Westford, MA 01886
   attn: Customer Service

Repair Tag

Repair Authorization Number _____

Model		Serial Number								

☐ Warranty repair ☐ Dead on arrival ☐ Repair ☐ Modification ☐ Recalibration

Symptoms: _____

_____

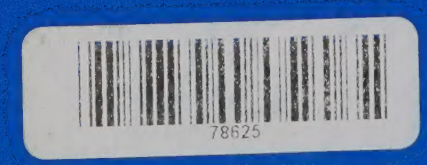
Name _____ Title _____

Company _____ Dept./MS _____

Address _____ City _____

State&Zip _____ Phone _____

Form 0163-1181A



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